RevMexAA (Serie de Conferencias), **29**, 165–165 (2007)

GOYA Ks-SELECTED GALAXY CATALOG $0 < z < 5$

D. Abreu,[1] M. Balcells,[1] C. E. García-Dabó,[1] M. Prieto,[1,2] P. Erwin,[1,3] and M. C. Eliche-Moral[1]

Using the $UBVIJK$ photometry from the GOYA Survey of the Groth strip, we have built a catalog with photometric redshifts for 2000 sources ($0 < z < 5$). For $z < 1.5$, excellent agreement is found with spectroscopic redshifts ($< dz/(1+z) >= 0.07$). Such catalog will provide a robust determination of the evolution of the K-band luminosity function, as well as the galaxy mass function.

In high-redshift galaxy studies, taking into account galaxy selection biases is critical. Photometric catalogs sample progressively bluer passbands for more distant galaxies. In optical surveys, the selection functions for early-type and star-forming galaxies differ dramatically when the images sample bands on the blue side of the Balmer jump. Selection on blue passbands gives catalogs with many low-mass starbursting galaxies, which miss some of the more massive early-type galaxies. Galaxy catalogs selected in NIR flux circumvent some of these problems. K-luminosities are a good proxy for galaxy mass up to at least $z \sim 1$.

We work with images of the Groth strip coming from the GOYA photometric survey (bands U, B, J, Ks) and from the HST MDS (bands F616W, F814W).

Steps: *(i)* Tie the astrometric solution for all bands to the same reference system. *(ii)* Build a catalog of K-band sources, record the sky coordinates of all sources. We used SExtractor (Bertin & Arnouts 1996). *(iii)* Create homogeneous-PSF images. Convolve all images by a Moffat kernel that brings their PSF to a FWHM = $1.3''$, which is the worst PSF in all the images. *(iv)* Create a replica of each homogeneous-PSF image. Place arbitrary, artificial sources at the coordinates corresponding to the K-band sources. *(v)* Use SExtractor in double-image mode to perform aperture photometry on all images of all bands. *(vi)* For HST imaging, where PSF convolution dramatically decreases the sky noise, perform simulations to estimate the true photometric errors as a function of source magnitude. *(vii)* Combine the aperture photometry catalogs from all bands, including only sources at sky positions that were looked in all the six filters.

The aperture photometry catalog provides an ideal input to HyperZ (Bolzonella et al. 2000), augmented with additional spectral templates for stars and QSOs, kindly provided by R. Pelló. We rejected all photometric redshift solutions with integrated probability below 10%. We compared our photometric redshift with the spectroscopic redshift obtained by the DEEP group (328 galaxies with $z < 1.5$), and an excellent agreement was found: $< dz/(1+z) >= 0.07$. Photometric redshifts were obtained for 1852 sources.

We are using the K-selected catalog to learn on the z-evolution of the K-band luminosity function. The galaxy luminosity function is a key ingredient in the study of galaxy formation and evolution. Traditionally, luminosity functions have been derived from optical bands. By deriving them from infrared bands, we can avoid problems with dust extinction; moreover, the K-correction is smaller. Also, infrared luminosity of galaxies is a good tracer of the galactic mass. One of our main purposes is to compare K-band luminosity functions with galaxy formation models and trace the evolution of luminosity function with redshift. Our goal is to obtain a non-biased determination of the LF. We have already proved that biases in standard methods (V/Vmax, STY, ...) are found in the following cases: Presence of large errors in redshift; Complex selection function; Mixture of heterogeneous parts in a large survey.

We are now developing a code that will take into account these effects and will provide unbiased estimation of the LF. The code is based on maximum likelihood methods. The final code will also take into account errors and combination of catalogues from both deep and shallow images. At this point we are carrying out Monte-Carlo simulations with the code to check its behavior in different pre-defined situations.

REFERENCES

Bertin, E., & Arnouts, S. 1996, A&AS, 117, 393

Bolzonella, M., Miralles, J.-M., & Pelló, R. 2000, A&A, 363, 476

Weiner, B. J., et al. 2005, ApJ, 620, 595

[1] Instituto de Astrofísica de Canarias, Vía Láctea s/n, 38200, La Laguna, Tenerife, Spain (dabreu@iac.es).

[2] Departamento de Astrofísica, Universidad de La Laguna, Tenerife, Spain.

[3] Max Planck Institute for Extraterrestial Physics, Garching, Germany.